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Mark a special word or phrase in this record: Mark!

Select one or more organism in this record: All organism / Bos taurus / Gallus gallus / Homo sapiens / Mus musculus — Submit

EC NUMBER COMMENTARY

2.4.1.212 -

RECOMMENDED NAME GeneOntology No.

hyaluronan synthase GO:0050501

SYSTEMATIC NAME

No entries in this field

SYNONYMS	ORGANISM	COMMENTARY	LITERATURE
CHAS2	-	SwissProt	-
CHAS3	-	SwissProt	-
DG42 protein	-	SwissProt	-
HA synthase	-	SwissProt	-
HuHAS1	-	SwissProt	-
hyaluronan synthethase	-	-	-
hyaluronate synthase	-	-	-
hyaluronate synthetase	-	-	-
hyaluronic acid synthase	-	-	-
hyaluronic acid synthetase	-	-	-
XHAS1	-	SwissProt	-
XHAS2	-	SwissProt	-
XHAS3	-	SwissProt	-

CAS REGISTRY NUMBER COMMENTARY

39346-43-5 -

REACTION	COMMENTARY
n UDP-N-acetyl-D-glucosamine + n UDP-D-glucuronate = [beta-N-acetyl-D-glucosaminyl(1->4)beta-D-glucuronosyl (1->3)]n+ 2n UDP	The enzyme from Streptococcus Group A and Group C requires Mg2+. It is highly specific for UDP-GlcNAc and UDP-GlcA; no copolymerization is observed if either is replaced by UDP-Glc, UDP-Gal, UDP-GalNAc or UDP-GalA. Similar enzymes have been found in a variety of organisms

REACTION TYPE	ORGANISM	COMMENTARY	LITERATURE
hexosyl group transfer	-	-	-

ORGANISM	COMMENTARY	LITERATURE

h be e e h f e h ec g

Bos taurus	Swissprot	-
Gallus gallus	Swissprot	-
Homo sapiens	-	13 , 15
Homo sapiens	Swissprot	-
Mus musculus	-	3 , 6 , 14
Mus musculus	Swissprot	-
Paramecium bursaria Chlorella virus 1	-	5
Pasteurella multocida	-	9 , 11
Rattus norvegicus	Swissprot	-
Streptococcus equisimilis	-	4 , 10
Streptococcus pyogenes	-	1 , 2 , 8 , 10 , 12
Streptococcus pyogenes	Swissprot	-
Xenopus DG42	-	7
Xenopus laevis	Swissprot	-

SUBSTRATE	PRODUCT	REACTION DIAGRAM	ORGANISM	COMMENTARY/ Substrate r:=reversible ir:=irreversible	LITERATURE/ Substrate	COMMENTARY/ Product	LI Pr
UDP-N-acetyl-D-glucosamine + UDP-D-glucuronate	UDP-D-glucuronate		Streptococcus pyogenes	-	1 , 2 , 8 , 10 , 12	-	
UDP-N-acetyl-D-glucosamine + UDP-D-glucuronate	UDP-D-glucuronate		Mus musculus	-	3 , 6 , 14	-	
UDP-N-acetyl-D-glucosamine + UDP-D-glucuronate	UDP-D-glucuronate		Streptococcus equisimilis	-	4 , 10	-	
UDP-N-acetyl-D-glucosamine + UDP-D-glucuronate	UDP-D-glucuronate		Paramecium bursaria Chlorella virus 1	-	5	-	
UDP-N-acetyl-D-glucosamine + UDP-D-glucuronate	UDP-D-glucuronate		Xenopus DG42	-	7	-	
UDP-N-acetyl-D-glucosamine + UDP-D-glucuronate	UDP-D-glucuronate		Pasteurella multocida	-	9 , 11	-	
UDP-N-acetyl-D-glucosamine + UDP-D-glucuronate	UDP-D-glucuronate		Homo sapiens	-	13 , 15	-	

NATURAL SUBSTRATE	NATURAL PRODUCT	REACTION DIAGRAM	ORGANISM	COMMENTARY SUBSTRATE	LITERATURE (Substrate)	COMMENTARY PRODUCT	LITERATURE (Product)	O (F
UDP-N-acetyl-D-glucosamine + UDP-D-glucuronate	UDP-D-glucuronate		Streptococcus pyogenes	-	1 , 2 , 8 , 10 , 12	-	-	
UDP-N-acetyl-D-glucosamine + UDP-D-glucuronate	UDP-D-glucuronate		Mus musculus	-	3 , 6 , 14	-	-	
UDP-N-acetyl-D-glucosamine + UDP-D-glucuronate	UDP-D-glucuronate		Streptococcus equisimilis	-	4 , 10	-	-	
UDP-N-acetyl-D-glucosamine + UDP-D-glucuronate	UDP-D-glucuronate		Paramecium bursaria Chlorella virus 1	-	5	-	-	
UDP-N-acetyl-D-glucosamine + UDP-D-glucuronate	UDP-D-glucuronate		Xenopus DG42	-	7	-	-	
UDP-N-acetyl-D-glucosamine + UDP-D-glucuronate	UDP-D-glucuronate		Pasteurella multocida	-	9 , 11	-	-	
UDP-N-acetyl-D-glucosamine + UDP-D-glucuronate	UDP-D-glucuronate		Homo sapiens	-	13 , 15	-	-	

COFACTOR ORGANISM COMMENTARY LITERATURE IMAGE

No entries in this field

METAL IONS	ORGANISM	COMMENTARY	LITERATURE
Co2+	Paramecium bursaria Chlorella virus 1	2% as effective as Mn2+ at similar concentrations <5>	5
Mg2+	Paramecium bursaria Chlorella virus 1	20% as effective as Mn2+ at similar concentrations <5>	5
Mg2+	Xenopus DG42	-	7
Mn2+	Paramecium bursaria Chlorella virus 1	essential for activity <5>	5
Mn2+	Pasteurella multocida	-	9

INHIBITORS	ORGANISM	COMMENTARY	LITERATURE	IMAGE
N-ethylmaleimide	Streptococcus pyogenes	-	12	2D-image

ACTIVATING COMPOUND ORGANISM COMMENTARY LITERATURE IMAGE

No entries in this field

KM VALUE [mM]	KM VALUE [mM] Maximum	SUBSTRATE	ORGANISM	COMMENTARY	LITERATURE	IMAGE
additional information	-	more	Mus musculus	values for other substrate concentrations <6>	6	-
0.03	-	UDP-D-glucuronate	Mus musculus	HAS2 <6>	6	2D-image
0.03	-	UDP-D-glucuronate	Mus musculus	HAS3 <6>	6	2D-image
0.04	-	UDP-D-glucuronate	Streptococcus pyogenes	-	10	2D-image
0.05	-	UDP-D-glucuronate	Streptococcus equisimilis	-	10	2D-image
0.06	-	UDP-D-glucuronate	Xenopus DG42	-	7	2D-image
0.07	-	UDP-D-glucuronate	Mus musculus	HAS1 <6>	6	2D-image
0.14	-	UDP-D-glucuronate	Pasteurella multocida	-	11	2D-image
0.06	-	UDP-N-acetyl-D-glucosamine	Streptococcus equisimilis	-	10	2D-image
0.08	-	UDP-N-acetyl-D-glucosamine	Mus musculus	HAS3 <6>	6	2D-image
0.11	-	UDP-N-acetyl-D-glucosamine	Mus musculus	HAS2 <6>	6	2D-image
0.14	-	UDP-N-acetyl-D-glucosamine	Streptococcus pyogenes	-	10	2D-image
0.16	-	UDP-N-acetyl-D-glucosamine	Pasteurella multocida	-	11	2D-image
0.23	-	UDP-N-acetyl-D-glucosamine	Xenopus DG42	-	7	2D-image
0.79	-	UDP-N-acetyl-D-glucosamine	Mus musculus	HAS1 <6>	6	2D-image

Ki VALUE [mM]	Ki VALUE [mM] Maximum	INHIBITOR	ORGANISM	COMMENTARY	LITERATURE	IMAGE

No entries in this field

TURNOVER NUMBER	TURNOVER NUMBER MAXIMUM	SUBSTRATE	ORGANISM	COMMENTARY	LITERATURE	IMAGE

No entries in this field

SPECIFIC ACTIVITY [µM/min/mg]	SPECIFIC ACTIVITY MAXIMUM	ORGANISM	COMMENTARY	LITERATURE

No entries in this field

pH OPTIMUM	pH MAXIMUM	ORGANISM	COMMENTARY	LITERATURE
7.6	**8.1**	Xenopus DG42	-	7
7.2	-	Paramecium bursaria Chlorella virus 1	-	5

h b e e e h f e h ec g

pH RANGE	pH RANGE MAXIMUM	ORGANISM	COMMENTARY	LITERATURE
7	8.4	Xenopus DG42	-	7

TEMPERATURE OPTIMUM | TEMPERATURE OPTIMUM MAXIMUM | ORGANISM | COMMENTARY | LITERATURE

No entries in this field

TEMPERATURE RANGE | TEMPERATURE MAXIMUM | ORGANISM | COMMENTARY | LITERATURE

No entries in this field

SOURCE TISSUE	ORGANISM	COMMENTARY	LITERATURE
breast adenocarcinoma cell	Mus musculus	B6-cell line <14>	14
glioma cell	Homo sapiens	cell line <13>	13
keratinocyte	Homo sapiens	-	15

LOCALIZATION	ORGANISM	COMMENTARY	GeneOntology No.	LITERATURE
membrane	Streptococcus pyogenes	enzyme is predicted to be an integral membrane protein <1>	GO:0016020	1 , 2 , 8 , 12
membrane	Mus musculus	-	GO:0016020	3 , 6

ACCESSION CODE	ENTRY NAME	ORGANISM	NO. OF AA	MOLECULAR WEIGHT [Da]	SOURCE	Sequence
O57427 pBLAST	HAS2_XENLA	Xenopus laevis	551	63685	Swissprot	Show Sequence
Q92819 pBLAST	HAS2_HUMAN	Homo sapiens	552	63566	Swissprot	Show Sequence
O97711 pBLAST	HAS2_BOVIN	Bos taurus	552	63459	Swissprot	Show Sequence
P70312 pBLAST	HAS2_MOUSE	Mus musculus	552	63492	Swissprot	Show Sequence
O35776 pBLAST	HAS2_RAT	Rattus norvegicus	552	63534	Swissprot	Show Sequence
P13563 pBLAST	HAS1_XENLA	Xenopus laevis	588	68522	Swissprot	Show Sequence
Q54865 pBLAST	HASA_STRPY	Streptococcus pyogenes	419	47886	Swissprot	Show Sequence
O00219 pBLAST	HAS3_HUMAN	Homo sapiens	553	63070	Swissprot	Show Sequence
O08650 pBLAST	HAS3_MOUSE	Mus musculus	554	63338	Swissprot	Show Sequence
Q61647 pBLAST	HAS1_MOUSE	Mus musculus	583	65544	Swissprot	Show Sequence
Q92839 pBLAST	HAS1_HUMAN	Homo sapiens	578	64884	Swissprot	Show Sequence
O57424 pBLAST	HAS2_CHICK	Gallus gallus	552	63744	Swissprot	Show Sequence

PDB ORGANISM

No entries in this field

MOLECULAR WEIGHT	MOLECULR WEIGHT MAXIMUM	ORGANISM	COMMENTARY	LITERATURE
66000	-	Homo sapiens	gel filtration <13>	13
52000	-	Mus musculus	SDS-PAGE <14>	14
48000	-	Mus musculus	northern blot <3>	3
47780	-	Streptococcus pyogenes	calculation from sequence <8>	8
47780	-	Streptococcus equisimilis	calculation from sequence <4>	4
42000	-	Streptococcus pyogenes	SDS-PAGE <1,2>	1 , 2
42000	-	Streptococcus equisimilis	-	4

SUBUNITS ORGANISM COMMENTARY LITERATURE

No entries in this field

POSTTRANSLATIONAL MODIFICATION ORGANISM COMMENTARY LITERATURE

No entries in this field

Crystallization/COMMENTARY ORGANISM LITERATURE

No entries in this field

pH STABILITY pH STABILITY MAXIMUM ORGANISM COMMENTARY LITERATURE

No entries in this field

TEMPERATURE STABILITY TEMPERATURE STABILITY MAXIMUM ORGANISM COMMENTARY LITERATURE

No entries in this field

GENERAL STABILITY ORGANISM LITERATURE

No entries in this field

ORGANIC SOLVENT ORGANISM COMMENTARY LITERATURE

No entries in this field

OXIDATION STABILITY ORGANISM LITERATURE

No entries in this field

STORAGE STABILITY	ORGANISM	COMMENTARY	LITERATURE
4°C, Na-phosphate buffer,10% glycerol, 96 h, 18%	Homo sapiens	-	13

Purification/COMMENTARY	ORGANISM	LITERATURE
partial <13>	Homo sapiens	13

Cloned/COMMENTARY	ORGANISM	LITERATURE
expression in COS-1 cells and rat 3Y1 fibroblasts <6>	Mus musculus	6
expression in Escherichia coli <1,2,8,10,12>	Streptococcus pyogenes	1 , 2 , 8 , 10 , 12

expression in Escherichia coli <4,10>	Streptococcus equisimilis	4 , 10
expression in Escherichia coli <5>	Paramecium bursaria Chlorella virus 1	5
expression in Escherichia coli <9,11>	Pasteurella multocida	9 , 11
expression in yeast <7>	Xenopus DG42	7

ENGINEERING	ORGANISM	COMMENTARY	LITERATURE
D196N	Pasteurella multocida	mutants possess UDP-D-glucuronate-transferase activity <11>	11
D477K	Pasteurella multocida	mutants possess UDP-N-acetyl-D-glucosamine-transferase activity <11>	11
more	Streptococcus pyogenes	variety of cystein mutatants <12>	12

Renatured/COMMENTARY ORGANISM LITERATURE

No entries in this field

APPLICATION ORGANISM COMMENTARY LITERATURE

No entries in this field

DISEASE TITLE OF PUBLICATION LINK TO PUBMED

No entries in this field

REF.	AUTHORS	TITLE	JOURNAL	VOL.	PAGES	YEAR	ORGANISM	COMMENTARY	LINK TO PUBME
1	DeAngelis, P.L.; Papaconstantinou, J.; Weigel, P.H.	**Molecular cloning, identification and sequence of the hyaluronan synthase gene from Group A Streptococcus pyogenes**	J. Biol. Chem.	268	19181-19184	1993	Streptococcus pyogenes	-	PubM
2	DeAngelis, P.L.; Weigel, P.H.	**Immunochemical confirmation of the primary structure of streptococcal hyaluronan synthase and synthesis of high molecular weight product by the recombinant enzyme**	Biochemistry	33	9033-9039	1994	Streptococcus pyogenes	-	PubM
3	Spicer, A.P.; Augustine, M.L.; McDonald, J.A.	**Molecular cloning and characterization of a putative mouse hyaluronan synthase**	J. Biol. Chem.	271	23400-23406	1996	Mus musculus	-	-
		Molecular cloning, expression, and characterization							

4	Kumari, K.; Weigel, P.H.	**of the authentic hyaluronan synthase from group C Streptococcus equisimilis**	J. Biol. Chem.	272	32539-32546	1997	Streptococcus equisimilis	-	PubM
5	DeAngelis, P.L.; Jing, W.; Graves, M.V.; Burbank, D.E.; Van Etten, J.L.	**Hyaluronan synthase of chlorella virus PBCV-1**	Science	278	1800-1803.	1997	Paramecium bursaria Chlorella virus 1	-	PubM
6	Itano, N.; Sawai, T.; Yoshida, M.; Lenas, P.; Yamada, Y.; Imagawa, M.; Shinomura, T.; Hamaguchi, M.; Yoshida, Y.; Ohnuki, Y.; Miyauchi, S.; Spicer, A.P.; McDonald, J.A.; Kimata, K.	**Three isoforms of mammalian hyaluronan synthases have distinct enzymatic properties**	J. Biol. Chem.	274	25085-25092	1999	Mus musculus	-	-
7	Pummill, P.E.; Achyuthan, A.M.; DeAngelis, P.L.	**Enzymological characterization of recombinant Xenopus DG42, a vertebrate hyaluronan synthase**	J. Biol. Chem.	273	4976-4981	1998	Xenopus DG42	-	-
8	Tlapak-Simmons, V.L.; Baggenstoss, B.A.; Clyne, T.; Weigel, P.H.	**Purification and lipid dependence of the recombinant hyaluronan synthases from Streptococcus pyogenes and Streptococcus equisimilis**	J. Biol. Chem.	274	4239-4245	1999	Streptococcus pyogenes	-	-
9	DeAngelis, P.L.	**Molecular directionality of polysaccharide polymerization by the Pasteurella multocida hyaluronan synthase**	J. Biol. Chem.	274	26557-26562	1999	Pasteurella multocida	-	PubM
10	Tlapak-Simmons, V.L.; Baggenstoss, B.A.; Clyne, T.; Weigel, P.H.	**Purification and lipid dependence of the recombinant hyaluronan synthases from Streptococcus pyogenes and Streptococcus equisimilis**	J. Biol. Chem.	274	4239-4245	1999	Streptococcus pyogenes, Streptococcus equisimilis	-	-
		Dissection of the two transferase activities of the							

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11	Jing, W.; DeAngelis, P.L.	**Pasteurella multocida hyaluronan synthase: two active sites exist in one polypeptide**	Glycobiology	10	883-889	2000	Pasteurella multocida	-	-
12	Heldermon, C.D.; Tlapak-Simmons, V.L.; Baggenstoss, B.A.; Weigel, P.H.	**Site-directed mutation of conserved cysteine residues does not inactivate the Streptococcus pyogenes hyaluronan synthase**	Glycobiology	11	1017-1024	2001	Streptococcus pyogenes	-	PubM
13	Asplund, T.; Brinck, J.; Suzuki, M.; Briskin, M.J.; Heldin, P.	**Characterization of hyaluronan synthase from a human glioma cell line**	Biochim. Biophys. Acta	1380	377-388	1998	Homo sapiens	-	-
14	Klewes, L.; Prehm, P.	**Intracellular signal transduction for serum activation of the hyaluronan synthase in eukaryotic cell lines**	J. Cell.Physiol.	160	539-544	1994	Mus musculus	-	PubM
15	Sayo, T.; Sugiyama, Y.; Takahashi, Y.; Ozawa, N.; Sakai, S.; Ishikawa, O.; Tamura, M.; Inoue, S.	**Hyaluronan synthase 3 regulates hyaluronan synthesis in cultured human keratinocytes**	J. Invest. Dermatol.	118	43-48	2002	Homo sapiens	-	PubM

LINKS TO OTHER DATABASES (specific for EC-Number 2.4.1.212)

ExPASy

Online Mendelian Inheritance in Man

KEGG

NCBI: PubMed, Protein, Nucleotide, Structure, Genome, OMIM, Domains

IUBMB Enzyme Nomenclature

WIT database

EMP Project

PDB database(3D structure)

PROSITE Database of protein families and domains

SYSTERS

Protein Mutant Database